REMARKS

In response to the objection to the drawings, a proposed drawing correction is submitted herewith in which the reference character 24 has been added in Figs. 3 and 4 to identify the "base", and corresponding amendments are made in the specification at pages 4 and 5. It is believed that these amendments will overcome the drawing objection.

Claim 19 has been amended to clarify the antecedent basis and to thereby overcome the rejection under 35 U.S.C. 112.

The present invention discloses a magnetic bearing assembly including a magnetic portion connected to a shaft and a base for simultaneously generating repulsive magnetic forces that are both a radially repulsive magnetic force and an axially repulsive magnetic force, and a bearing portion connected to the shaft and the base for supporting the shaft upon rotation of the shaft. The claims have been amended in order to more clearly distinguish the present invention from the cited references. Claims 16-18 are combined to form amended Claim 16 in order to clearly define the configuration of the upper magnetic portion including an inner magnetic ring and an outer magnetic ring. After reviewing the patents to Marchal, Jarvik, Miyamoto, Yokono, and Wampler, it is believed that the amended claims 1, 16, 29 and 30 are patentable over the cited references for the following reasons. Also, the amendments to the text of the specification are in accordance with the above statements, and no new matter has been entered accordingly.

REJECTION UNDER 35 U.S.C. § 102

Claims 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Marchal et al. (FR Patent No. 1,273,897; hereinafter, Marchal). According to the present invention, the magnetic portion can simultaneously generate a radially repulsive magnetic force and an axial repulsive magnetic force. However, Marchal does not teach the configuration of the present invention. In particular, Marchal only discloses an axially magnetic force to orient the shaft (See Figure 1 or 6) and does not mention any radial magnetic force. Therefore, the efficacy of

Marchal is not as good as that of the present invention and Marchal cannot position the shaft in both the radial and axial direction. From the above comparisons, it is apparent that the present application is not anticipated, taught or suggested by Marchal.

REJECTION UNDER 35 U.S.C. § 103

The Examiner rejected Claims 1, 6, 7, 13, and 28 under 35 U.S.C. 103(a) as being unpatentable over Jarvik (US Patent No. 5,507,629; hereinafter, Jarvik) and Miyamoto (JP Patent No. 55-36635; hereinafter, Miyamoto).

First of all, Jarvik just teaches a single magnet on the rotor and the stator which are radially aligned. Besides, Jarvik does not mention any bearing portion structure for supporting the shaft upon rotation of the shaft. Further, Jarvik and the present invention belong to completely different applied fields and their operating principles are also different. Hence, the amended independent claims are not anticipated, taught or suggested by Jarvik.

As to Miyamoto, the main purpose of Miyamoto is to increase the spring constant in the radial direction by providing the inverse polarity ring magnet with the back surface contacting the top surface of the fixed side magnet. Furthermore, Miyamoto just mentions a set of magnets to increase the spring constant in the radial direction. It is hard to position the shaft in both the radial and axial direction just according to Miyamoto. However, the present invention discloses that a magnetic bearing assembly comprises a magnetic portion having an upper magnetic portion and a lower magnetic portion respectively disposed in opposite orientations respectively for simultaneously generating a radially repulsive magnetic force and an axially repulsive magnetic force. Hence, the amended independent claims are not anticipated, taught or suggested by Miyamoto, or by Jarvik in view of Miyamoto.

The Examiner rejected Claims 1, 6, 7, 12 and 28 under 35 U.S.C. 103(a) as being unpatentable over Yokono (J.P. Patent No. 62-095,952) in view of Miyamoto.

Actually, Yokono only discloses that the shaft 5 and the magnetic bearings 8 interact in repulsion to provide the repulsive magnetic force. However, Yokono does not disclose any bearing portion like the present invention. Hence, the amended independent claims are not anticipated, taught or suggested by Yokono.

As to Miyamoto, as mentioned before, the amended independent claims are not anticipated, taught or suggested by Miyamoto.

Therefore, from the above comparisons, it is apparent that the present application is not anticipated, taught or suggested by Yokono in view of Miyamoto.

The Examiner rejected Claims 18, 19, 26 and 27 under 35 U.S.C. 103(a) as being unpatentable over Marchal in view of Wampler (US Patent No. 5,840,070). First of all, the field of Wampler relates to the field of blood pumps. However, the field of the invention relates to a magnetic bearing assembly adapted to be used in the motor for supporting a rotating shaft. Therefore, they are different applied fields.

Furthermore, according to lines 13-16, column 6 of Wampler (referring to Fig. 8), the magnetic force in the axial direction will be largely counterbalanced to the opposing magnetic attraction of magnets 34 to magnet 31. Hence, Wampler only provides an attractive force in the axial direction. On the contrary, in the present invention, the magnetic portion can simultaneously generate radially and axially repulsive magnetic forces to prevent the friction between the shaft and the bearing, and position the shaft both in the axial and radial directions. Therefore, from the above comparisons, it is apparent that the present application is not anticipated, taught or suggested by Wampler in view of Marchal.

In summary, the present invention is clearly distinguishable over all of the above-noted prior art documents.

Favorable reconsideration by the Examiner, withdrawal of the rejections, and formal notification of the allowability of all claims are solicited.

Respectfully submitted,

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Version with Markings to Show Changes Made:

In the Specification:

Page 4, lines 11-27 and page 5, lines 1-24, please amend as follows:

Fig. 3 is a schematic diagram of the magnetic bearing assembly according to the first embodiment of the present invention. The magnetic bearing assembly includes a magnetic portion and a bearing portion. The bearing portion is a sleeve bearing 5. The magnetic portion comprises an upper magnetic portion comprising three magnetic rings, i.e. 51, 52 and 53, and a lower magnetic portion comprising three magnetic rings, i.e. 511, 521 and 531. In the upper magnetic portion, the first magnetic ring 51 and the second magnetic ring 52 are connected to a base 24 associated with the stator 23 and the third magnetic ring 53 is connected to the shaft 21. The second magnetic ring 52 and the third magnetic ring 53 are disposed in radial alignment, wherein these two rings are assembled with each other to have the like polar disposition for generating repulsive magnetic field. In addition, the first magnetic ring 51 and the second magnetic ring 52 are disposed in axial alignment to have opposite polar disposition for generating an axially repulsive magnetic field. The radially repulsive magnetic field, generated between the second magnetic ring 52 and the third magnetic ring 53, and the axially repulsive magnetic filed, generated between the first magnetic ring 51 and the second magnetic ring 52, allow to reduce friction between the sleeve bearing 5 and the shaft 21 upon rotation of the shaft. The same situation may be deduced by analogy that the three magnetic rings 511, 521 and 531 in the lower magnetic portion facilitate reducing friction between the sleeve bearing 5 and the shaft 21 upon rotation.

Fig. 4 is a schematic diagram of the magnetic bearing assembly according to the second embodiment of the present invention. The magnetic bearing assembly includes a magnetic portion and a bearing portion. The bearing portion is a sleeve bearing 5. The magnetic portion

comprises an upper magnetic portion having two magnetic rings, i.e. an inner magnetic ring 73 and an outer magnetic ring 74, and a lower magnetic portion having three magnetic rings, i.e. 75, 76 and 77. In the upper magnetic portion, the inner magnetic ring 73 is connected to the shaft 21 and the outer magnetic ring 74 is connected to the stator 23. These two magnetic rings 73 and 74 are disposed in radial alignment with each other to have like polar disposition for generating repulsive magnetic field. In the lower magnetic portion, the first magnetic ring 75 and the third magnetic ring 77 are connected to the shaft 21 and the second magnetic ring is connected to a base 24 associated with the stator 23. These three magnetic rings 75, 76 and 77 are disposed in axial alignment to have opposite polar disposition for generating axially repulsive magnetic fields. Therefore, the friction between the sleeve bearing 5 and the shaft 21 upon rotation is considerably reduced.

In The Claims:

1. (Amended) A magnetic bearing assembly adapted to be used in a motor, comprising:

a magnetic portion connected to a shaft and a base for simultaneously generating a radially repulsive magnetic force and an axially repulsive magnetic force, wherein said magnetic portion includes an upper magnetic portion and a lower magnetic portion which are symmetrically disposed in opposite orientations respectively; and

a bearing portion connected to said shaft and said base for supporting said shaft upon rotation of said shaft[connected to said shaft],

wherein each of said upper magnetic portion and said lower magnetic portion includes a first magnetic ring and a second magnetic ring connected to said base, and a third magnetic ring connected to said shaft,

said first magnetic ring and said second magnetic ring are in substantially axial alignment so as to interact in repulsion to provide said axially repulsive magnetic force, and

said third magnetic ring is substantially aligned with said second magnetic ring so as to provide said radially repulsive magnetic force, whereby said first magnetic ring and said third magnetic ring interact in repulsion to provide said repulsive magnetic force and keep the shaft axially positioned.

16. (Amended) A magnetic bearing assembly adapted to be used in a motor, comprising:

a [lower] first magnetic portion connected to a shaft and a base for generating a repulsive magnetic force, wherein said [lower] first magnetic portion has a first magnetic ring and a second magnetic ring connected to said shaft, a third magnetic ring connected to said base, and said first, second and third magnetic ring being juxtaposed along axial alignment to produce an axially repulsive magnetic force;

a second magnetic portion including an inner magnetic ring and an outer magnetic ring for providing a radially repulsive magnetic force; and

a bearing portion connected to said shaft and said base for supporting said shaft upon rotation of said shaft.

19. (Amended) The magnetic bearing assembly according to Claim [17]16, wherein said inner magnetic ring and said outer magnetic ring are disposed in radial alignment with each other to have like polar disposition.

26. (Amended) The magnetic bearing assembly according to Claim [18]16, wherein said outer magnetic ring has an inner surface formed by a diameter of said outer magnetic ring and said inner magnetic ring has an outer surface formed by a diameter of said inner magnetic ring so that said outer surface of said inner magnetic ring is substantially aligned with said inner surface of said outer magnetic ring to provide radially repulsive magnetic force.

27. (Amended) The magnetic bearing assembly according to Claim [18]16, wherein said outer magnetic ring is connected to said base and said inner magnetic ring is connected to said shaft.

29. (New) A magnetic bearing assembly adapted to be used in a motor, comprising:

a magnetic portion connected to a shaft and a base for simultaneously generating a radially magnetic force and an axially magnetic force, wherein said magnetic portion includes a first magnetic portion and a second magnetic portion which are disposed symmetrically in opposite orientations for respectively simultaneously providing said radially and axially magnetic forces; and

a bearing portion connected to said shaft and said base for supporting said shaft upon rotation of said shaft.

30. (New) A magnetic bearing assembly adapted to be used in a motor, comprising:

a magnetic portion connected to a shaft and a base for simultaneously generating a radially magnetic force and an axially magnetic force, wherein said magnetic portion includes a first magnetic portion for providing said radially magnetic force and a second magnetic portion for providing said an axially magnetic force; and

a bearing portion connected to said shaft and said base for supporting said shaft upon rotation of said shaft.